Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules Regarding Dedicated Short Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band)	)	WT Docket No. 01-90
	)	
Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of the Intelligent Transportation Services	)	ET Docket No. 98-95 RM-9096

Comments of ARINC Incorporated

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March 14, 2003

TABLE OF CONTENTS

page

TABLE OF CONTENTS (continued)

page

I. INTRODUCTION

A. FCC Proceedings in ET Docket No. 98-95

These comments are presented in response to the Federal Communications Commission ("FCC") Notice of Proposed Rulemaking ("NPRM"), ET Docket No. 98-95, released on November 15, 2002. This NPRM solicited public comment on the proposed use, licensing, and technical rules for the 75 MHz in the 5.9 GHz band (5.850-5.925 GHz) for Dedicated Short Range Communications (DSRC).

B. ARINC

ARINC is a world leader in the development and operation of communications and information processing systems, providing systems engineering and integration solutions to the government and transportation industries. Founded in 1929 to provide reliable and efficient radio communications for the airlines, ARINC is headquartered in Annapolis, Maryland, and has over 80 locations worldwide.

ARINC participated in the development of the petition for allocation of the 5.850 – 5.925 GHz band for Dedicated Short-Range Communications Service in 1996 and 1997 and has continued to work with the wide range of government and private organizations that have been developing applicable standards and defining the recommend service and licensing rules that were submitted by ITS America as *Ex Parte* comments in July 2002.

ARINC is pleased to be part of this important effort and provide the following comments in response to the Notice of Proposed Rule Making for this band.

II. COMMENTS

A. The DSRC Definition

1. Voice or Non-Voice Capability (para. 15)

The definition of "Dedicated Short-Range Communications Service," originally adopted in the Allocation Report and Order does not cover the communication needs for all of the DSRC- Based ITS applications envisioned by the ITS community. The Definition of DSRC as amended by the ITS America *Ex Parte* comments of July 2002 is adequate to cover the communication needs for all of the DSRC- Based ITS applications envisioned by the ITS community. This amended definition includes the reference to transferring data that would include the video and audio component of the "Emergency Vehicle Video Relay" application. Voice information will be sent on the channel but in communications zones established by Roadside Units (RSUs) along the highway. These communications would not routinely occur in real-time because the duration of characteristic DSRC communication links vary between, the usual, less than 1 second, to the infrequent, 30 seconds. These time ranges are acceptable for very high data-rate, large-file transmissions but are not long enough to support a significant, real-time, two-way conversation. Also, when a DSRC-equipped vehicle is stopped or traveling at slow speed, the DSRC range limits audio and video transmission capability to short distances around RSU "hot spot" locations. Voice information should be permitted in order to support applications such as stored or real-time video off-loads and voice and data exchanges at electronic payment locations, but would be limited by the characteristics of the service.

2. Private or Commercial Uses (para. 16)

DSRC is intended as a service that would be made available to transportation safety agencies, vehicle manufacturers, and private users to establish nationally interoperable, high data

rate, low- latency, short to medium range communication zones in those locations necessary to improve the safety and efficiency of travel, and provide for the localized information needs of a vehicle. Regional deployment of any commercial service that would blanket the roadways with DSRC equipment for a user access fee to serve only a few of the many applications possible would deprive the transportation agencies and traveling public of channel availability or capacity needed to provide the safety services. The eligibility and channel plan described in the ITS America *Ex Parte* comments of July 2002 support widespread vehicle-to-vehicle safety messages, location-specific roadside-to-vehicle messages, and location-specific private data transfers with priority given to safety messages. The ITS America proposal cannot simultaneously support the channel plan and channel capacity needs of a ubiquitous "commercial system" and ensure that transportation agencies will have priority access in such deployment environment. However, to the extent that commercial entities can use the ITS-A proposed band plan to provide service to potential customers in strategic locations, in same way that private users would, commercial use could be compatible. The limitations listed in the ITS America description are critical to the successful operation of the band for its intended purpose but exclude no user from access. The ITS America plan only excludes a regional monopoly of a valuable resource.

B. Eligibility

1. Primary Use for Public Safety (para. 18)

ARINC supports the conclusion that the 5.9 GHz band should be used primarily for "public safety purposes." No other short-range communications capability exists for the proposed data rates, ranges, and channel capacity that offers public agencies or vehicle manufacturers a low-cost, high-availability, low-latency way of communicating with vehicles or

between vehicles in a way to increase highway safety. DSRC was created as a protected band in which public safety messages sent to the public or between vehicles could get the priority they need in order to be effective. Vehicle manufacturers, USDOT, State DOTs, Toll Road Agencies, radio manufacturers are all[1] currently working together to bring applications to the public that improve the efficiency and safety of the nation's highways and streets using the 5.9 GHz band.

2. Definition of Public Safety Radio Services (para. 20)

In response to the request for comment on whether the FCC should define "public safety" for the purposes of the ITS radio services consistent with the public safety radio services exemption in Section 309(j)(2) of the Act or in some other manner, the following comment is provided. The ITS radio service rules should define "public safety" in a manner consistent with the public safety radio services exemption in Section 309(j)(2) of the Communication Act of 1934 with the addition of vehicle manufacturers that install radio equipment for vehicle-to-vehicle communications for the purposes of preventing or decreasing the severity of accidents.

ARINC believes that using Section 337(f)(1) of the Act for the purposes of defining Public safety for the ITS radio services is too restrictive and therefore should not be used.

3. Should We Permit Non-Public Safety DSRC Operations in the 5.9 GHz Band and What Should Be the Dfinition of Non-Public Safety Services (para. 22)

In response to the request for comment on whether non-public safety DSRC operations should be permitted in the 5.9 GHz band, the following comment is provided. ARINC supports

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[1] Members of the DSRC Standards writing committees include representatives from the following organizations: 3-M, AASHTO, AMTECH, ARINC, ARMSTRONG CONSULTING, ATHEROS, BMW, CALTRANS, DAIMLER-CHRYSLER, DENSO, FORD, GM, GTRI, , HIGHWAY ELECTRONICS, HONDA, HITACHI, IDMICRO, IMEC, INTERSIL, ITS-A, JHU/APL, KING COUNTY METRO TRANSIT, MARK IV, MiCOM Spa, MICHIGAN STATE DOT, ,MITRETEK, MOTOROLA, PANASONIC, NISSAN, N.Y. THRUWAY AUTHORITY,

non-public safety DSRC operations in the 5.9 GHz band because their inclusion will tend to increase the number of DSRC devices in vehicles. Drivers who do not see the need for a safety-specific device in their vehicle may want some of the other services that DSRC devices enable, and then will have the safety capability as an additional benefit. We believe that private services provided by DSRC will increase the impact on safety by encouraging more drivers to acquire DSRC communications capability for their vehicles. In addition, the definition for DSRC "non-public safety services" provided by ITS America should be used.

C. Interoperability

1. Should All Applications Be Interoperable (para. 31)

DSRC is a radio medium that enables Public Safety information, cautions, warnings, and road or street operational data to reach the public in the shortest possible time. In order to accomplish this, a channel is identified in which all units listen for short public safety messages or announcements of private services on other channels. These short messages and service announcements must support private applications in addition to public safety applications because the public does not want a communications device for each individual service. The auto industry and common sense require that the number of radio devices in the vehicle be minimized to as few as possible, to achieve both an acceptable cost threshold and efficient use of available space. Implementing both public and private service in one DSRC device provides the maximum utility and cost effectiveness for the user. The proposed channel plan and DSRC Standard (ASTM E2213-02) enable this service to implement the identified safety applications while also supporting a wide variety of private radio application communication needs. The ASTM E2213-02 DSRC standard ensures that all radios have a common hardware and software

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OKI ELECTRIC, PATH, RAYTHEON, SIRIT, SUMITOMO ELECTRIC, TECHNOCOM, TOSHIBA, TOYOTA, TRANSCORE, VISTEON, WASHINGTON STATE DOT, VW, and Wi-LAN

structure that enables every radio to communicate with every other radio. All safety applications that use this radio structure must be interoperable in order to be effective and all private applications must be interoperable in the way they use the band to prevent interference between applications. Although all private applications do not have to be interoperable, the equipment and software that allows them to successfully share the radio service with other applications must be interoperable. ARINC supports the ITS America proposed rules along with the adoption of the ASTM E2213-02 standard which establishes the minimum interoperability needed for public and private applications in the DSRC Service.

2. Should DSRC Be Excluded from the Current Interoperability Definition (para. 31)

In response to the request for comment on whether the FCC should revise its definition of interoperability to exclude DSRC, ARINC supports the current definition for interoperability as being adequate for safety services and should include DSRC.

3. Should the FCC Adopt a Separate Definition of "Interoperability" for DSRC Operations (para. 31)

The FCC should, as suggested, add equipment compatibility to include the requirement that On-Board Units and Road Side Units coming from different vendors should be interchangeable and interoperable. An OBU or RSU manufactured by vendor X must be able to communicate and exchange information with OBUs manufactured by vendor Y and OBUs and RSUs manufactured by vendor Y should be able to communicate and exchange information with OBUs manufactured by vendor X.

4. Should the FCC Adopt a DSRC Standard (para. 33)

ARINC encourages the FCC to adopt the ASTM E2213-02 standard for public safety and private DSRC operations. Although private industry is substantially in agreement, any one company could elect to not follow a voluntary standard. If a mandatory standard is not adopted, one or more companies could introduce radio techniques in the band that would be incompatible and could interfere with safety operations. The protection of safety applications was one of the primary arguments for the allocation of this band. By mandating an open standard, the FCC's goal of competitive neutrality is achieved resulting in a common standard that manufacturers can use to build the most reliable, cost-effective, power-efficient, feature-rich, or otherwise most customer appealing devices. Innovation is accommodated through the standard development process that will allow the standard to evolve as additional capabilities and techniques are introduced.

5. Should DSRC Devices Be Type Certified (para. 33)

ARINC supports type certification as the most effective way of assuring that all DSRC devices meet the requirements of the FCC rules to achieve non-interference and interoperability in the band.

6. Will Rapid Technology Change Render a Particular Standard Obsolete (para. 33)

DSRC is based on OFDM technology which is in the early stages of its life cycle. This technology is destined for vehicles which must have technology stability over relatively long periods of time. Vehicles must be supported through a ten to twenty year life cycle and any communication architecture must be interoperable with a wide variety of newer and older

vehicles over this period of time. Adoption of a standard would spur development of the DSRC service by giving the vehicle manufacturers a stable development platform for their communication based safety services. The standard development process can introduce innovation in a backward compatible manner that does not render vehicles obsolete that have not completed their ten to twenty year life cycle.

7. Is the ASTM-DSRC Standard the Appropriate Standard (para. 34)

In response to the request for comment on whether ASTM-DSRC Standard is the right standard, the following comment is provided. The OFDM technology has been tested and shown to support the requirements for communications in the highly mobile environment. A wide variety of organizations, including DSRC equipment manufacturers, OFDM chip manufacturers, vehicle manufacturers, State DOTs, Toll Agencies, Universities, traffic engineers, radio experts, wireless local area network experts, and a range of consultants have worked on developing and have agreed that the ASTM E 2213 standard is the appropriate standard. The ASTM-DSRC standard works at the speeds, ranges, and modes proposed in the ITS America *Ex Parte* comments of July 2002.

D. Band Plan

1. Channelization Plan (para. 36)

ARINC supports the adoption of the ITS America recommended channelization plan with one modification. The ITS America Plan is a carefully thought-out solution to the problem of properly addressing the wide variety of applications that have been proposed for this service. The control channel solves the problem of low latency access to safety and application announcement messages. Service channels 180, 181, and 182 enable the lowest latency, short-

range, high data rate, variable packet size, small RSU separation distance applications. Service channels 174. 175 and 176 enable the lowest latency, large zone, high data rate, variable packet size, and larger RSU separation distance applications. In each of the two types of applications, short-range and large zone, multiple service channels are needed to provide non-interfering or reduced interference operation in a multiple RSU installation. At least two channels are needed for each type of service to be effective in multiple RSU installations, or where multiple single RSU installations are clustered together. The two- (2) twenty-megahertz channels, Channels 175 and 181, enable the highest data rate, short-range, data transfer functions in locations where there is sufficient separation between users such that no interference or acceptable levels of interference would be present. Service channel 184 enables the highest power, for coordinated RSU and safety applications, and alternatively provides another channel for large zone private applications in areas where the channel is available and not being used for safety applications.

Extensive research and discussion subsequent to the ITS America submission has lead to modification of the suggested operation of channel 172. It is now proposed that this channel be reserved for very low-latency, high exchange rate, safety messages between vehicles and between the vehicle and the roadside units. This channel should therefore be assigned for emergency communications between vehicles, or from the roadside units to vehicles after contact has been established on the control channel. This channel would be used to conduct emergency communications of extremely low latency, which could be considered less than 5 ms, and high exchange frequency, in the range of less than 1 to 5 ms transmission intervals. This rapid exchange could cause brief periods of congestion if implemented on the control channel and would suffer unacceptable latencies due to current message traffic if implemented on a regular service channel. On regular service channels, emergency messages would have to wait for any

large packet non-emergency messages to end, which could take up to 3 ms, before obtaining control of the channel. This channel (172) would be used to avoid or mitigate accidents and perform other safety communications functions. Channel 172 should be reserved for use by applications that need immediate access to a low-traffic channel. This channel is intended to be used to meet the extreme requirements of the imminent accident mitigation application and other extreme low-latency applications.

2. Control Channel (para. 37)

ARINC would like to clarify the explanation of control channel operation. The FCC discussion indicated that ITS America proposed "the Control Channel be used for communications shorter the 200 microseconds and in intervals of no less that two seconds. ITS America actually requested that a maximum limit of 200 microseconds for any single control channel transmission be included in the rules and that the minimum interval necessary to prevent channel saturation was still under evaluation. Two seconds is not the suggested minimum interval for common applications. Two seconds is requested as the minimum interval to be allowed for non- vehicle mounted OBUs (portable operation). The minimum interval for vehicle-mounted OBUs (the common case) is still being researched and discussed, but the following goals have been established. The minimum required access time on the control channel is currently to be 100 milliseconds with a probability of success consistent with the single message success rate give by the communications environment. Therefore, the minimum transmission interval on the control channel is currently considered to be 100 milliseconds. The DSRC standards committee is in the process of developing a standard that will describe the mechanisms and required limits of the control channel operation.

3. Alternate Band Plan (para. 38)

The ITS America recommended channelization plan should be adopted with the modifications stated above. Five (5) MHz channels would not provide the data rates or channels capacities needed to support the planned applications and vehicle densities. All of the channels and the diversity provided in the band plan described are required to provide the wide variety of envisioned safety services. Previously, safety and transportation organizations have implemented interagency communications to improve their service to the public. This band is unique in that one of its uses provides communications from safety and transportation organizations to the public. Each of the communications service types described in the previous section support some type of safety service. Also, since safety services in some channels are high priority but infrequent occurrences, there is capacity available in these channels to provide private services that will encourage users to obtain DSRC devices for their vehicles. ARINC recommends that the band not be split into radio services, since that would result in an increase in the number, cost and complexity of radios.

Five megaHertz of reserved spectrum is sufficient. The proposed plan is a finely tuned solution to the application issues at hand and requires the entire spectrum included in the band plan to work.

4. Mutually Exclusive Licensed Spectrum Size (para. 39)

In response to the request for comment on the appropriate amount of spectrum to be provided to each licensee in the event that the [FCC] selects a licensing plan that results in mutually exclusive applications for initial licenses, the following comments are provided. There is no appropriate amount of spectrum to be provided for mutual exclusive applications for initial licenses because by implementing both small zones with 50 ft separation distance and large zone

channels with a Carrier Sense Multiple Access technique to detect potential message collisions and frequency coordination, the ITS America proposal provides a non-mutually exclusive solution for all applications in the band. In this band, channel use is always shared with other users of the band. There is no need for mutually exclusive licenses for the applications proposed for this band.

E. Licensing Plan

1. RSU Licensing Plan (para. 47)

In response to the request for comment on licensing RSUs by geographic areas or a site-by-site licensing, the following comment is provided. The ITS America recommendation for site-by-site and public safety corridor licensing should be adopted.

2. OBU Licensing Plan (para. 54)

In response to the request for comment on licensing OBUs by rule or Part 15 authorization, the following comment is provided. ARINC supports the proposal that all OBUs should be licensed by rule.

III. CONCLUSION

The ITS America Ex Parte comments of July 2002 were developed from the best efforts of a wide variety of people and organizations. The suggested band use and licensing procedures should enable the most effective implementation of the proposed public and private services

and create the largest possible user base for the 5.9 GHz band. ARINC recommends that the FCC adopt the ITS America suggested rules for the 5.9 GHz band, except where identified in these comments.

Respectfully submitted,
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